

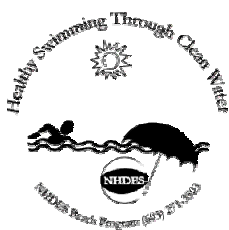
Wallis Sands State Park, Rye

BEACH WATER QUALITY REPORT

SUMMER 2006



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BACKGROUND

The New Hampshire Department of Environmental Services (DES) has operated a Public Beach Inspection Program, or Beach Program, for over 20 years. An established coastal beach monitoring program began in 1989 and the program continues to provide monitoring on a weekly basis. DES recognizes the health threat at public beaches. As a result, increased beach monitoring and bacteria source tracking have been implemented to further protect public health.

Coastal beaches are monitored for the presence of the fecal bacteria *Enterococci*. These fecal bacteria are present in the intestines of warm-blooded animals including humans. Fecal bacteria, when present in high concentrations and ingested, can commonly cause gastrointestinal illnesses such as nausea, vomiting and diarrhea. They are also known as indicator organisms, meaning their presence in water may indicate the presence of other potentially pathogenic organisms.

In October of 2000, the United States Environmental Protection Agency (EPA) signed into law the Beaches Environmental Assessment and Coastal Health (BEACH) Act. The BEACH Act is an amendment to the Clean Water Act, which authorizes the EPA to award grants to eligible states. The purpose of the BEACH Act is to reduce the risk of disease to users of the nation's recreational waters. BEACH Act grants provide support for development and implementation of monitoring and notification programs that help protect the public from exposure to pathogenic microorganisms in coastal recreation waters.

DES received grant funding in 2002 to develop and implement a beach monitoring and notification program consistent with EPA's performance criteria requirements published in the *National Beach Guidance and Required Performance Criteria for Grants* document (www.epa.gov/waterscience/beaches/grants). DES has successfully met all requirements and continues to expand the monitoring and notification program. In 2002, only nine coastal beaches were monitored, while in 2003 and 2004, 15 and 16 beaches respectively, were monitored on a routine basis. Fifteen beaches were sampled again in 2005 and 2006. In 2004, volunteers sampled Star Island beach, but circumstances did not allow for this cooperative effort in 2005 and 2006.

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Beach Description

Wallis Sands State Park is owned and maintained by the New Hampshire Division of Parks and Recreation, State Parks Bureau. Wallis Sands State Park is comprised of sand and has a total length of 661 feet. The beach is frequently used by residents, vacationers and school or camp groups for various recreational activities. There are three access points to the beach area from the parking lot (Figure 1). Lifeguards are present throughout the summer and toilet and shower facilities are available (Figure 1).

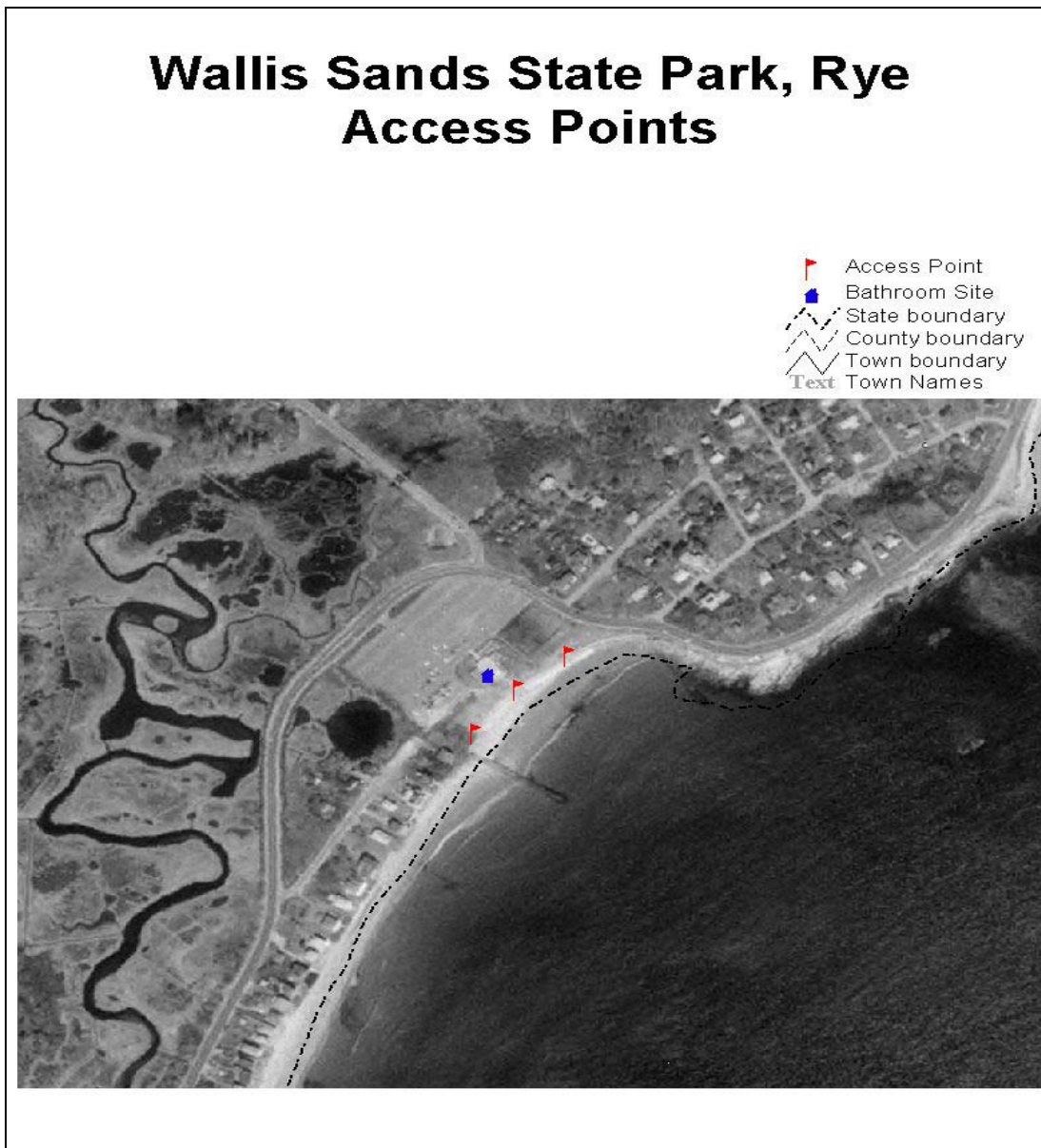


Figure 1. Wallis Sands State Park Access Points and Restroom Facilities

A small number of waterfowl were occasionally observed at the beach. Dogs are restricted from state-owned beaches and are rarely observed at this beach.

Below is a brief description of the sampling stations at Wallis Sands State Park, Rye. The stations are pictured in Figure 2. For all stations, parking is available for a small fee at the Wallis Sands State Park main parking lot on Route 1A.

Table 1. Station Descriptions

Description	Latitude	Longitude
Left sample station: located directly in front of the northern beach entrance.	43° 1' 39.9353"	-70° 43' 39.5886"
Center sample station: located directly in front of the center main beach entrance and lifeguard station.	43° 1' 38.6517"	-70° 43' 41.2885"
Right sample station: located directly in front of the southern beach entrance by the rock wall that separates Wallis Sands Beach from Pirates Cove Beach.	43° 1' 37.396"	-70° 43' 42.8041"

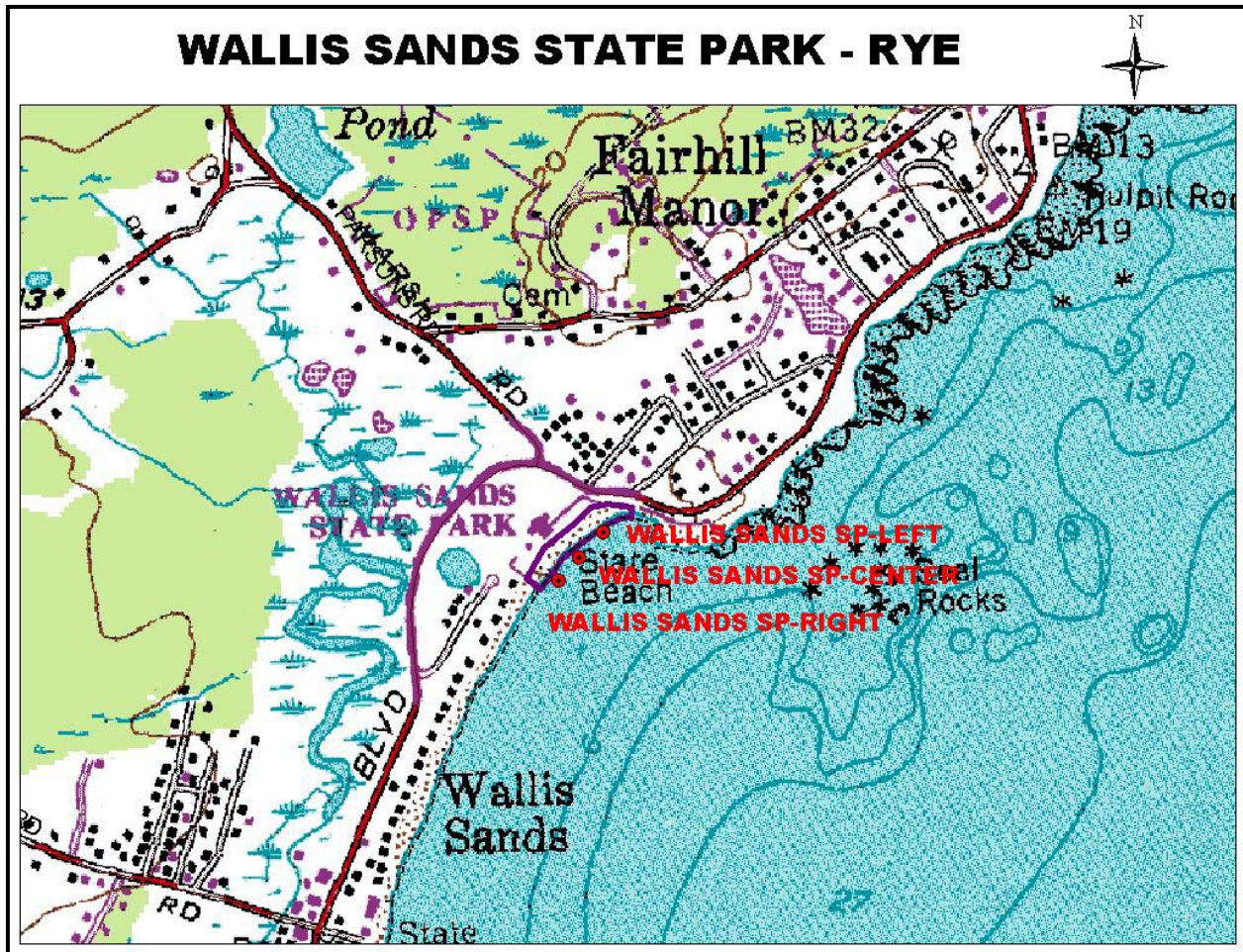


Figure 2. Map of Wallis Sands Beach

Tier Status and Sampling Frequency

The Beach Program developed a risk-based beach evaluation process and tiered monitoring approach and implemented this approach during the 2003 beach season. Beach evaluations are conducted annually to determine potential health threats to the public. Evaluations are based on several criteria in three main categories: beach history, microbial pathogen sources, and beach use. The evaluations for the 2006 season included a new criterion to assess beaches. Beaches are now assessed as impaired for bacteria. Impairments are based the most recent version of the Consolidated Assessment and Listing Methodology (CALM) submitted to EPA by DES every two years. The CALM assesses beach units as impaired based on historical exceedances of both the single sample and geometric mean bacteria standards.

Based on these criteria, beaches were assigned a Tier I-Impaired, Tier I or Tier II status in 2006. Tier I-Impaired beaches are high priority and have an increased potential to affect public health, Tier I are medium priority, while Tier II are low priority beaches that have less potential to affect public health. Beach sample frequency is based on the Tier statuses; Tier I-Impaired beaches

were sampled twice per week, Tier I beaches were sampled once per week, and Tier II beaches were sampled once every other week in 2006.

Wallis Sands is a Tier I beach. It was categorized as a Tier I beach based on the Beach Program's Risk-Based Evaluation ranking system. This ranking indicates that there is frequent beach use when compared to other coastal beaches. The beach ranking has not changed since the ranking system was implemented in 2002. Because Wallis Sands is a Tier I beach, samples are collected once per week.

Water Quality

Beaches are monitored to ensure compliance with State Water Quality Standards. Marine waters are analyzed for the presence of the fecal bacteria *Enterococci*. *Enterococci* are known as indicator organisms, meaning their presence may indicate the presence of other pathogenic organisms. The state standard for *Enterococci* at public beaches is 104 counts/100 mL in one sample, or a geometric mean of 35 counts/100 mL in three samples collected over 60 days. Standard exceedances require the issuance and posting of a beach advisory. Beach advisories remain in effect until subsequent beach sampling indicates safe water quality conditions.

The number of samples collected at each beach is a function of beach length. Beaches less than 100 feet in length are sampled at left and right locations 1/3 of the distance from either end of the beach. Beaches greater than 100 feet in length are bracketed into thirds and sampled at left, center and right locations. Routine sample collection may be enhanced by sampling known or suspected pollution sources to the beach area. Storm event sampling may be conducted at beaches where wet-weather events are expected to affect beach water quality.

The 2006 season's weather can best be described as unpredictable. The 2006 sampling season began May 30. During the month of May, New Hampshire experienced flood conditions typical of a 100-year flood, while the months of June and July were wetter and warmer than normal, and August was unseasonably cool and dry. May had over 17 inches of rain setting a record high for the month and over eight inches of rain fell during June (as recorded at Pease International Tradeport, Portsmouth, N.H.). Precipitation was recorded on 34 days of the 95 day sampling season. Twenty-two beach days (beach hours 9:00a.m. to 5:00p.m.) were directly affected by precipitation. There were a total of 15 routine inspections performed at Wallis Sands State Park and 45 samples collected in 2006.

Table 2 and Figure 3 depict the *Enterococci* data from each sampling event in 2006. Overall, the summer 2006 *Enterococci* levels were very low for public beaches. The samples collected on July 12 revealed elevated *Enterococci* levels. Over 1.5" of rainfall occurred prior to sampling, likely transporting bacteria laden waters into the beach area. A safety inspection was conducted resulting in *Enterococci* levels well below the state standard. Many New Hampshire coastal beaches were impacted by this storm with high *Enterococci* levels (Figure 3). No advisories were issued for Wallis Sands in 2006.

Table 2. Wallis Sands State Park Beach Enterococci Data 2006

Date Sampled	Station Name	Enterococci Results (counts per 100 mL)
6/1/2006	Left	10
	Center	10
	Right	10
6/5/2006	Left	10
	Center	10
	Right	10
6/14/2006	Left	10
	Center	10
	Right	10
6/20/2006	Left	10
	Center	10
	Right	10
6/26/2006	Left	10
	Center	10
	Right	10
7/6/2006	Left	10
	Center	10
	Right	10
7/12/2006	Left	100
	Center	100
	Right	100
7/14/2006	Left	20
	Center	10
	Right	5
7/17/2006	Left	10
	Center	30
	Right	10
7/26/2006	Left	10
	Center	20
	Right	10
8/1/2006	Left	10
	Center	10
	Right	10
8/7/2006	Left	10
	Center	10
	Right	40
8/17/2006	Left	10
	Center	10
	Right	10
8/22/2006	Left	10
	Center	10
	Right	10

8/28/2006	Left	10
	Center	10
	Right	10

Figure 3 depicts the relationship between Enterococci data at Wallis Sands State Beach and the state standard for coastal beaches.

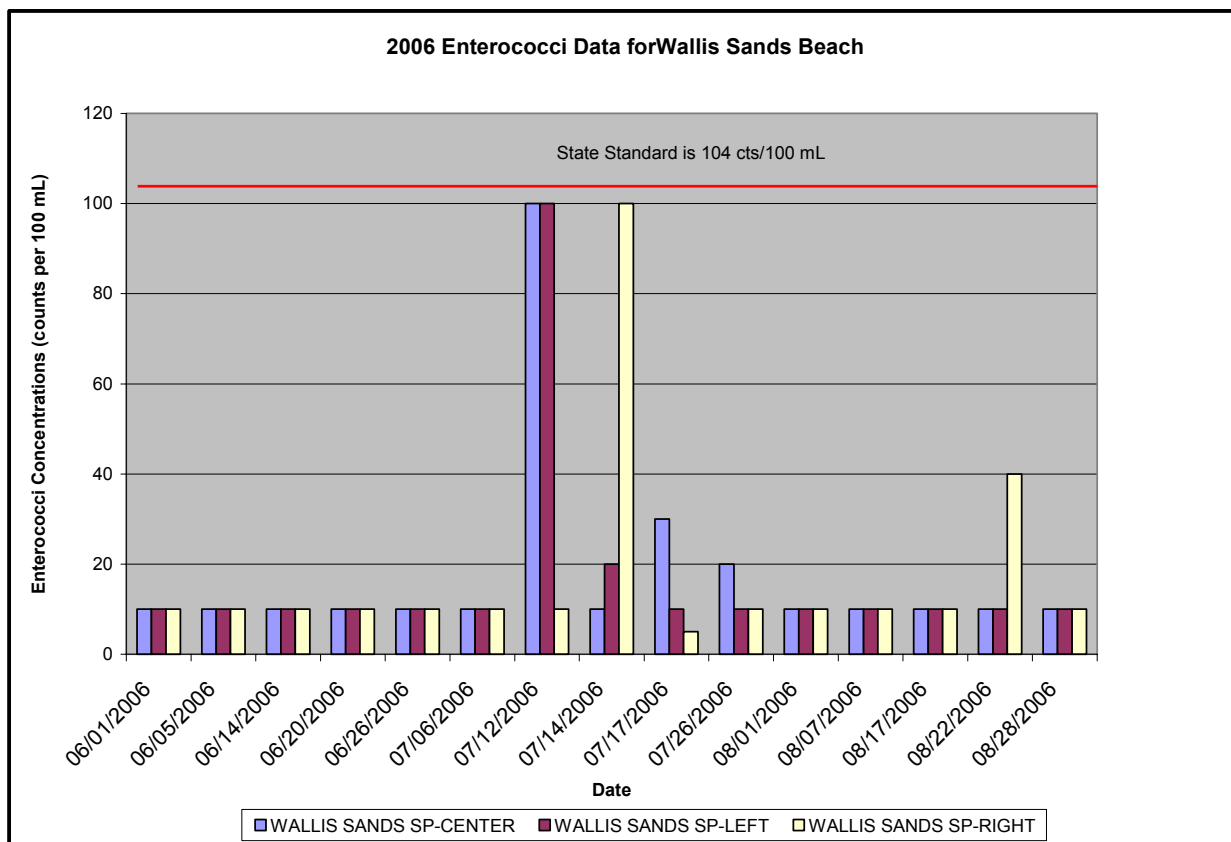


Figure 3. Wallis Sands State Park Beach Enterococci Data 2006

Areas of Concern

Wallis Sands State Park is a very popular beach for residents and especially children's groups. The beach experiences a high bather load in a concentrated section of New Hampshire's coast. There is a rock jetty on the southern end that separates the beach from Pirates Cove Beach and the land juts out at the northern end of the beach, providing a sheltered beach area. This could prevent the area from receiving regular flushing with the open ocean water and concentrate bacteria concentrations. Bacteria data collected at this site do not confirm elevated bacteria levels within the swimming area.

Wallis Sands State Park operates its own waste water treatment facility that discharges 180 feet seaward of the high tide line at the northern end of the beach. The treatment effluent is

discharged during the summer months when park facilities are open to the public. The waste water is exposed to UV radiation prior to discharge and there is no evidence at this time that the effluent has a direct impact to beach water quality.

Thoughts for the Future

- A study to document the amounts of bacteria in the sand at Wallis Sands State Park may be warranted. Studies in other areas of the country have measured concentrated populations of bacteria in the onshore sand near the water line (also called the swash zone, see Special Topic for more information). If the town is interested in pursuing a scientific study, the Beach Program has funds available to support such an activity. Please contact Alicia Carlson to discuss your options, (603) 271-0698 or acarlson@des.state.nh.us.

Appendix A

Special Topic 2006

Rapid Assessment Methodology for the Detection of Microbiological Indicators

To assess beach water quality, the Department of Environmental Services (DES) monitors fecal indicator bacteria levels at coastal beaches on a routine basis. Unfortunately, results from sample analysis can take anywhere from 24 to 48 hours. Because it takes at least 24 hours to receive results, beach managers and the public are not informed of water quality problems until after the public may have been exposed. This is an issue facing beach officials throughout the world, and is a



priority of the US Environmental Protection Agency (EPA). The EPA, universities and private entities are researching rapid assessment methods to enumerate bacteria and viruses. These methods will allow beach officials to post advisories on the same day water quality is impaired, thus, better protecting public health. There are three different rapid assessment method technologies available: Molecular surface recognition, nucleic acid detection and enzyme/substrate based methods. All rapid assessment methods will take less than two hours to obtain results.

Molecular surface recognition methods capture and/or label the target bacterium by binding to molecular structures on the exterior surface or in its genetic material. Analyses of coastal beach water samples currently employ culture-based methods for the detection of Enterococci bacteria, an indicator for fecal pollution in marine water. The quickest culture-based method takes up to 24 hours to provide results. Now, a new method is being developed to enumerate Enterococci. This new method uses Transcription-Mediated Amplification (TMA) with a fluorescently-labeled probe to amplify a specific region of Enterococci ribosomal RNA (rRNA).

The TMA rapid assessment method is currently being tested in Southern California. Method development is moving quickly and will likely come to execution within five years. Method cost is a significant reason the new technology is not currently employed. Once this procedure is widely and routinely accepted, the expenses should lower. This rapid assessment method is very beneficial as it will allow beach managers to take immediate action towards protecting the public from waterborne pathogen exposure on the same day that the water is sampled.

Another rapid assessment method being developed for fecal indicator detection is Quantitative Polymerase Chain Reaction (QPCR). QPCR is a nucleic acid detection method that targets genetic material of bacteria, viruses or protozoan indicators. QPCR is used to test for both *E. coli* and Enterococci. Results can be obtained from this method on an average of two hours after sampling. This method has demonstrated 85-90 percent agreement with existing routine methods. QPCR can be used to detect other water quality indicators such as *Bacteroides thetaiotamicron* and human enterovirus. Studies indicate that ratios of *B. thetaiotamicron* may provide useful information as to fecal contamination sources.

The final rapid assessment technology methods available are the enzyme/substrate based methods. These methods pair chromogenic or fluorogenic substrate methods already widely used with advanced optical or electrical detectors. These methods are directed at reducing the incubation periods of current membrane filtration methods. Some of these methods measure excitation and absorbance of the fluorescent metabolite of Enterococci using a fluorometer to speed the detection rate. A popular type of enzyme/substrate method is the Dual-Wavelength Fluorimetry (DWF).

These rapid assessments methods are currently being tested for accuracy, sensitivity and efficiency. Research indicates that these new methods will be made available within the next five years. Once these technologies are made available and laboratories adopt the methods, beach management will have a new tool to better protect public health. With assistance from EPA Beach Grants, New Hampshire will be proactive in employing accepted methods.